

MULTIMEDIA



UNIVERSITY

STUDENT ID NO

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MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER III, 2021/2022

PMT0301 – MATHEMATICS III

(Foundation in Information Technology)

08 AUGUST 2022
9.00 a.m.-11.00 a.m.
(2 Hours)

INSTRUCTIONS TO STUDENT

1. This question paper consists of **FOUR** printed pages, excluding cover page, formula and statistical table.
2. Answer **ALL THREE** questions. The distribution of the marks for each question is given.
3. Please write all your answers in the **Answer Booklet**.
4. All necessary working steps **MUST** be shown to obtain maximum marks.

QUESTION 1 [15 marks]

- a) Find the symmetric equation for the line passes through points $A(-1, 2, 1)$ and $B(2, 0, 3)$. Use the point A .
[2 marks]
- b) Given two vectors $\underline{a} = \langle 1, 2, 4 \rangle$ and $\underline{b} = \langle 8, 4, -1 \rangle$.
- i) Find a vector perpendicular to both $\underline{a}$ and $\underline{b}$.
- ii) Find an equation of a plane which passes through point $P(3, -1, 1)$ and contains both the vectors $\underline{a}$ and $\underline{b}$. Write your final answer in simplest form.
[5 marks]
- c) Amanda has recorded a sample of 108 telephone calls received by a customer service department. The duration of each call is recorded in the following frequency table.

Duration (minutes)	Frequency (f)
1–3	7
4–6	16
7–9	35
10–12	33
13–15	15
16–18	2

Rewrite the table in your answer booklet and add columns for midpoint(x), fx , fx^2 and cumulative frequency.

- i) Calculate the mean, variance and standard deviation for the duration of telephone calls.
- ii) Calculate the median of the telephone calls.

[8 marks]

Continued...

QUESTION 2 [15 marks]

- a) In an arithmetic progression, the 7th term is three times the 2nd term. Also, the sum of the first 10 terms of the progression is 120.

- i) Find the first term and the common difference.
ii) Find the 11th term.

[3 marks]

- b) Express $2.5\dot{3}\dot{6}$ as a mixed fraction. Show all steps by using geometric progression.

[2 marks]

- c) Find the term consisting x^4 in the binomial expansion of $\left(x^3 + \frac{1}{x^2}\right)^8$.

[2 marks]

- d) Given a matrix $A = \begin{bmatrix} 1 & 1 & 0 \\ x-3 & 2 & 1 \\ 1 & x-4 & 1 \end{bmatrix}$. If $|A| = -8$, find the value of x .

[3 marks]

- e) Given matrix $A = \begin{pmatrix} 3 & 2 & 1 \\ 2 & 5 & 6 \\ 3 & 4 & 5 \end{pmatrix}$ and its cofactor matrix $C = \begin{pmatrix} 1 & 8 & -7 \\ -6 & 12 & -6 \\ 7 & -16 & 11 \end{pmatrix}$.

- i) Find the determinant and inverse matrix of A .
ii) Hence, solve the following system of linear equations by inverse method.

$$3x + 2y + z = 34$$

$$2x + 5y + 6z = 57$$

$$3x + 4y + 5z = 56$$

[5 marks]

Continued...

QUESTION 3 [20 marks]

- a) Find the number of ways can all letters of the words **PETALINGJAYA** be arranged such that
- i) no restriction,
 - ii) the first letter is **P** and the last letter is **A**,
 - iii) all letters **A** must be together,
 - iv) the first letter is a consonant and the last letter is a vowel.

[5 marks]

- b) In a factory, a total of 240 workers drive three types of cars, namely Kancil (*K*), Toyota (*T*) and Waja (*W*), as shown in the table below.

Type of car	Male (<i>M</i>)	Female (<i>F</i>)
Kancil (<i>K</i>)	60	70
Toyota (<i>T</i>)	30	10
Waja (<i>W</i>)	50	20

If a worker in the factory who drives a car to work is picked at random, find the probability that the worker

- i) drives a Kancil car or a Toyota car,
- ii) is a male or a worker who drives a Waja car,
- iii) drives a Toyota car given that the worker is a female,
- iv) is a male who drives a Toyota car given that the worker drives a Toyota car.

[5 marks]

Continued...

- c) In a factory, the number of accidents occurring in a week follows a Poisson distribution with mean of 4.2. Find the probability that
- i) at least 3 accidents will occur in a particular week.
 - ii) exactly 5 accidents will occur in a particular fortnight.
- [5 marks]
- d) The marks for Mathematics III in a final exam are normally distributed with a mean of 62 and a standard deviation of 8.
- i) If a student is chosen at random, find the probability that the student obtain grade A with marks more than 74.
 - ii) How many failures out of 120 students who took the exam, if the passing mark is 40.
- [4 marks]
- e) A random variable X has a normal distribution with a mean of 28 and a standard deviation of σ . Given the z -score is 2 when $X = 29.6$. Find the value of σ .
- [1 marks]

End of Page.

PMT0301: FORMULAE

$$\mathbf{u} \cdot \mathbf{v} = |\mathbf{u}| |\mathbf{v}| \cos \theta$$

$$|\mathbf{u} \times \mathbf{v}| = |\mathbf{u}| |\mathbf{v}| \sin \theta$$

$$A^{-1} = \frac{1}{|A|} C^T$$

$$A^{-1} = \frac{1}{|A|} \text{adj } A$$

$$\mu = \frac{\sum x}{N} \quad ; \quad \bar{x} = \frac{\sum x}{n} = \frac{\sum mf}{n}$$

$$\sigma^2 = \frac{\sum x^2 - \frac{(\sum x)^2}{N}}{N} = \frac{\sum m^2 f - \frac{(\sum mf)^2}{N}}{N}$$

$$s^2 = \frac{\sum x^2 - \frac{(\sum x)^2}{n}}{n-1} = \frac{\sum m^2 f - \frac{(\sum mf)^2}{n}}{n-1}$$

$$\text{Mode} = L + \left[\frac{f_m - f_B}{(f_m - f_B) + (f_m - f_A)} \right] c$$

$$\text{Median} = L + \left[\frac{\left[\frac{\sum f}{2} \right] - F_L}{f_m} \right] c$$

$$a_n = a + (n-1)d$$

$$S_n = \frac{n}{2} [2a + (n-1)d]$$

$$a_n = ar^{n-1}$$

$$S_n = \frac{a(1-r^n)}{1-r}$$

$${}^nP_r = \frac{n!}{(n-r)!} \quad {}^nC_r = \frac{n!}{(n-r)!r!}$$

$$\text{Additive Rule :} \quad P(A \cup B) = P(A) + P(B) - P(A \cap B)$$

$$\text{Complementary Events :} \quad P(A) + P(A') = 1$$

$$\text{Conditional Probability :} \quad P(B/A) = \frac{P(A \cap B)}{P(A)} \quad , \quad P(A) > 0$$

$$\text{Multiplicative Rule :} \quad P(A \cap B) = P(B/A)P(A)$$

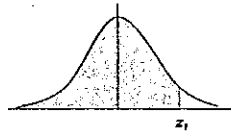
$$\text{Independent Events :} \quad P(A \cap B) = P(A)P(B)$$

$$P(X = x) = {}^nC_x p^x q^{n-x} \quad , \quad x = 0, 1, 2, 3, \dots, n$$

$$P(X = x) = \frac{\lambda^x e^{-\lambda}}{x!} \quad , \quad x = 0, 1, 2, 3, \dots$$

$$Z = \frac{X - \mu}{\sigma}$$

Standard Normal Distribution



$$p(z \leq z_1) = \frac{1}{\sqrt{2\pi}} \int_{-\infty}^{z_1} e^{-\frac{1}{2}z^2} dz$$

The Normal Distribution Function

x	Φ(x)	x	Φ(x)	x	Φ(x)	x	Φ(x)
0.00	0.5000	0.50	0.6915	1.00	0.8413	1.50	0.9332
0.01	0.5040	0.51	0.6950	1.01	0.8438	1.51	0.9345
0.02	0.5080	0.52	0.6985	1.02	0.8461	1.52	0.9357
0.03	0.5120	0.53	0.7019	1.03	0.8485	1.53	0.9370
0.04	0.5160	0.54	0.7054	1.04	0.8508	1.54	0.9382
0.05	0.5199	0.55	0.7088	1.05	0.8531	1.55	0.9394
0.06	0.5239	0.56	0.7123	1.06	0.8554	1.56	0.9406
0.07	0.5279	0.57	0.7157	1.07	0.8577	1.57	0.9418
0.08	0.5319	0.58	0.7190	1.08	0.8599	1.58	0.9429
0.09	0.5359	0.59	0.7224	1.09	0.8621	1.59	0.9441
0.10	0.5398	0.60	0.7257	1.10	0.8643	1.60	0.9452
0.11	0.5438	0.61	0.7291	1.11	0.8665	1.61	0.9463
0.12	0.5478	0.62	0.7324	1.12	0.8686	1.62	0.9474
0.13	0.5517	0.63	0.7357	1.13	0.8708	1.63	0.9484
0.14	0.5557	0.64	0.7389	1.14	0.8729	1.64	0.9495
0.15	0.5596	0.65	0.7422	1.15	0.8749	1.65	0.9505
0.16	0.5636	0.66	0.7454	1.16	0.8770	1.66	0.9515
0.17	0.5675	0.67	0.7486	1.17	0.8790	1.67	0.9525
0.18	0.5714	0.68	0.7517	1.18	0.8810	1.68	0.9535
0.19	0.5753	0.69	0.7549	1.19	0.8830	1.69	0.9545
0.20	0.5793	0.70	0.7580	1.20	0.8849	1.70	0.9554
0.21	0.5832	0.71	0.7611	1.21	0.8869	1.71	0.9564
0.22	0.5871	0.72	0.7642	1.22	0.8888	1.72	0.9573
0.23	0.5910	0.73	0.7673	1.23	0.8907	1.73	0.9582
0.24	0.5948	0.74	0.7704	1.24	0.8925	1.74	0.9591
0.25	0.5987	0.75	0.7734	1.25	0.8944	1.75	0.9599
0.26	0.6026	0.76	0.7764	1.26	0.8962	1.76	0.9608
0.27	0.6064	0.77	0.7794	1.27	0.8980	1.77	0.9616
0.28	0.6103	0.78	0.7823	1.28	0.8997	1.78	0.9625
0.29	0.6141	0.79	0.7852	1.29	0.9015	1.79	0.9633
0.30	0.6179	0.80	0.7881	1.30	0.9032	1.80	0.9641
0.31	0.6217	0.81	0.7910	1.31	0.9049	1.81	0.9649
0.32	0.6255	0.82	0.7939	1.32	0.9066	1.82	0.9656
0.33	0.6293	0.83	0.7967	1.33	0.9082	1.83	0.9664
0.34	0.6331	0.84	0.7995	1.34	0.9099	1.84	0.9671
0.35	0.6368	0.85	0.8023	1.35	0.9115	1.85	0.9678
0.36	0.6406	0.86	0.8051	1.36	0.9131	1.86	0.9686
0.37	0.6443	0.87	0.8078	1.37	0.9147	1.87	0.9693
0.38	0.6480	0.88	0.8106	1.38	0.9162	1.88	0.9699
0.39	0.6517	0.89	0.8133	1.39	0.9177	1.89	0.9706
0.40	0.6554	0.90	0.8159	1.40	0.9192	1.90	0.9713
0.41	0.6591	0.91	0.8186	1.41	0.9207	1.91	0.9719
0.42	0.6628	0.92	0.8212	1.42	0.9222	1.92	0.9726
0.43	0.6664	0.93	0.8238	1.43	0.9236	1.93	0.9732
0.44	0.6700	0.94	0.8264	1.44	0.9251	1.94	0.9738
0.45	0.6736	0.95	0.8289	1.45	0.9265	1.95	0.9744
0.46	0.6772	0.96	0.8315	1.46	0.9279	1.96	0.9750
0.47	0.6808	0.97	0.8340	1.47	0.9292	1.97	0.9756
0.48	0.6844	0.98	0.8365	1.48	0.9306	1.98	0.9761
0.49	0.6879	0.99	0.8389	1.49	0.9319	1.99	0.9767
0.50	0.6915	1.00	0.8413	1.50	0.9332	2.00	0.9772

x	$\Phi(x)$	x	$\Phi(x)$	x	$\Phi(x)$	x	$\Phi(x)$
2.00	0.97725	2.50	0.99379	3.00	0.99865	3.50	0.99977
2.01	0.97778	2.51	0.99396	3.01	0.99869	3.51	0.99978
2.02	0.97831	2.52	0.99413	3.02	0.99874	3.52	0.99978
2.03	0.97882	2.53	0.99430	3.03	0.99878	3.53	0.99979
2.04	0.97932	2.54	0.99446	3.04	0.99882	3.54	0.99980
2.05	0.97982	2.55	0.99461	3.05	0.99886	3.55	0.99981
2.06	0.98030	2.56	0.99477	3.06	0.99889	3.56	0.99981
2.07	0.98077	2.57	0.99492	3.07	0.99893	3.57	0.99982
2.08	0.98124	2.58	0.99506	3.08	0.99896	3.58	0.99983
2.09	0.98169	2.59	0.99520	3.09	0.99900	3.59	0.99983
2.10	0.98214	2.60	0.99534	3.10	0.99903	3.60	0.99984
2.11	0.98257	2.61	0.99547	3.11	0.99906	3.61	0.99985
2.12	0.98300	2.62	0.99560	3.12	0.99910	3.62	0.99985
2.13	0.98341	2.63	0.99573	3.13	0.99913	3.63	0.99986
2.14	0.98382	2.64	0.99585	3.14	0.99916	3.64	0.99986
2.15	0.98422	2.65	0.99598	3.15	0.99918	3.65	0.99987
2.16	0.98461	2.66	0.99609	3.16	0.99921	3.66	0.99987
2.17	0.98500	2.67	0.99621	3.17	0.99924	3.67	0.99988
2.18	0.98537	2.68	0.99632	3.18	0.99926	3.68	0.99988
2.19	0.98574	2.69	0.99643	3.19	0.99929	3.69	0.99989
2.20	0.98610	2.70	0.99653	3.20	0.99931	3.70	0.99989
2.21	0.98645	2.71	0.99664	3.21	0.99934	3.71	0.99990
2.22	0.98679	2.72	0.99674	3.22	0.99936	3.72	0.99990
2.23	0.98713	2.73	0.99683	3.23	0.99938	3.73	0.99990
2.24	0.98745	2.74	0.99693	3.24	0.99940	3.74	0.99991
2.25	0.98778	2.75	0.99702	3.25	0.99942	3.75	0.99991
2.26	0.98809	2.76	0.99711	3.26	0.99944	3.76	0.99992
2.27	0.98840	2.77	0.99720	3.27	0.99946	3.77	0.99992
2.28	0.98870	2.78	0.99728	3.28	0.99948	3.78	0.99992
2.29	0.98899	2.79	0.99736	3.29	0.99950	3.79	0.99992
2.30	0.98928	2.80	0.99744	3.30	0.99952	3.80	0.99993
2.31	0.98956	2.81	0.99752	3.31	0.99953	3.81	0.99993
2.32	0.98983	2.82	0.99760	3.32	0.99955	3.82	0.99993
2.33	0.99010	2.83	0.99767	3.33	0.99957	3.83	0.99994
2.34	0.99036	2.84	0.99774	3.34	0.99958	3.84	0.99994
2.35	0.99061	2.85	0.99781	3.35	0.99960	3.85	0.99994
2.36	0.99086	2.86	0.99788	3.36	0.99961	3.86	0.99994
2.37	0.99111	2.87	0.99795	3.37	0.99962	3.87	0.99995
2.38	0.99134	2.88	0.99801	3.38	0.99964	3.88	0.99995
2.39	0.99158	2.89	0.99807	3.39	0.99965	3.89	0.99995
2.40	0.99180	2.90	0.99813	3.40	0.99966	3.90	0.99995
2.41	0.99202	2.91	0.99819	3.41	0.99968	3.91	0.99995
2.42	0.99224	2.92	0.99825	3.42	0.99969	3.92	0.99996
2.43	0.99245	2.93	0.99831	3.43	0.99970	3.93	0.99996
2.44	0.99266	2.94	0.99836	3.44	0.99971	3.94	0.99996
2.45	0.99286	2.95	0.99841	3.45	0.99972	3.95	0.99996
2.46	0.99305	2.96	0.99846	3.46	0.99973	3.96	0.99996
2.47	0.99324	2.97	0.99851	3.47	0.99974	3.97	0.99996
2.48	0.99343	2.98	0.99856	3.48	0.99975	3.98	0.99997
2.49	0.99361	2.99	0.99861	3.49	0.99976	3.99	0.99997
2.50	0.99379	3.00	0.99865	3.50	0.99977	4.00	0.99997

